



Illinois Department of Transportation

To: Kensil Garnett
From: Jack A. Elston
Subject: Pavement Design Approval
Date: February 28, 2019

Attn: Karen Dvorsky
By: Michael Brand *msb*

Route: I-74
Section: (90-14HB-1)BR1
County: Tazewell
Limits: Interchange at Pinecrest Drive

Job No.: P-94-010-09
Contract No.: 68894
Target Letting: 06CY19

We have reviewed the pavement design for the above referenced project which was originally submitted on December 21, 2018, then clarified and re-submitted on February 22, 2019. The scope of the project involves removal and replacement of the existing structure carrying Pinecrest Drive over I-74, removal and replacement of 1300 feet of Pinecrest Drive, and removal and replacement of approximately 800 feet of the interchange ramps.

The pavement design resulted in two pavement options: 10.25" Full-Depth HMA and 9" PCC. The life-cycle cost analysis of those options resulted in the PCC pavement being less expensive by more than 30% for both Pinecrest Drive and the I-74 ramps.

In summary, the approved pavement design is as follows:

Pinecrest Drive and the I-74 Ramps
9" PCC Pavement with tied PCC Shoulders
No Stabilized Subbase
12" Aggregate Subgrade Improvement

If you have any questions, please contact Mike Brand at (217) 782-7651.

Project Description

The proposed improvement consists of the removal and replacement of the existing structure carrying Pinecrest Drive over I- 74 (S.N. 090-0091), located approximately 2 miles east of the IL Route 8 interchange in East Peoria. This pavement design is for the reconstruction of the Pinecrest Drive structure over I-74 and the reconstruction of I-74 ramps to tie into the new Pinecrest Drive structure.

Recommendation

According to the BDE Manual – Figure 54-1.A, the designs considered for this Pavement Design are the Mechanistic Pavement Designs for both Flexible (Full-Depth HMA) and Rigid (JPCP) pavements. The project is approximately 2,100 feet and approximately 11,025 square yards of pavement. Based on the Mechanistic Pavement Design computations (see Exhibit C and D), the Flexible (Full-Depth HMA) pavement thickness would be 10.25 inches and the Rigid (JPCP) pavement thickness would be 9.0 inches.

The life-cycle cost analysis yielded the following results (see Exhibit E and F):

	Present Cost/Lane-Mile/Year	Total Life-Cycle Cost
Flexible Pavement (HMA) – Pinecrest Drive	\$110,656	\$668,011
Flexible Pavement (HMA) – I-74 Ramps	\$69,853	\$259,501
Rigid Pavement (JPCP) - Pinecrest Drive	\$83,293	\$502,821
Rigid Pavement (JPCP) - I-74 Ramps	\$53,266	\$197,881

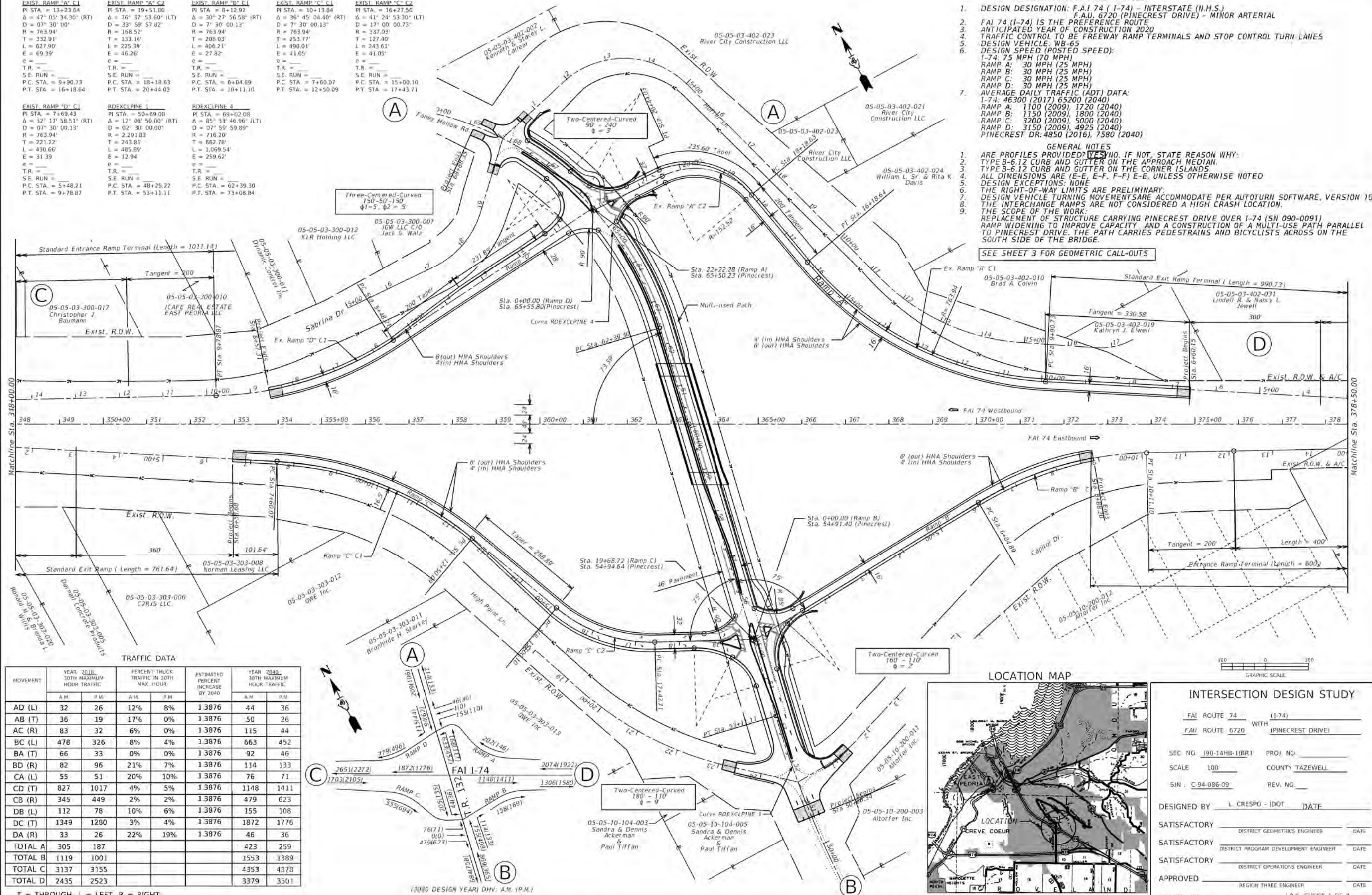
For Pinecrest Drive, the total life-cycle cost of the Rigid Pavement is 32.9% less than Flexible Pavement. For the I-74 Ramps, the total life-cycle cost of the Rigid Pavement is 31.1% less than the Flexible Pavement. The District recommends using 9.0” JPCP Pavement and 12” Aggregate Subgrade Improvement for both Pinecrest Drive and the I-74 Ramps in order to match the existing pavement, for the ease of stage construction, and for the lower maintenance life-cycle cost.

Note that for Pinecrest Drive to result in a Rigid pavement thickness of 9.0 inches we assumed on the IDOT Mechanistic Pavement Design computation sheet that the route was an Other Marked State Route instead of an Unmarked State Route. Using an Unmarked State Route resulted in a pavement thickness of 8.0 inches and we wanted to match the existing 9.0 inches on Pinecrest Drive and the proposed 9.0 inches at the I-74 Ramps.



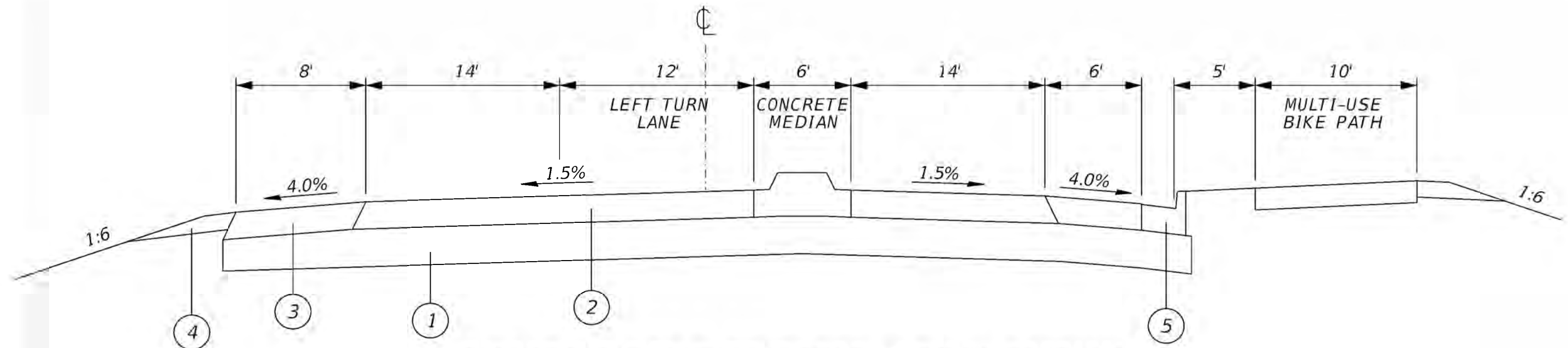
FILE NAME =	USER NAME = #USER#	DESIGNED -	REVISED -	STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION		LOCATION MAP JOB NO. P-94-010-09		F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
#FILE#		DRAWN -	REVISED -					74	(90-14HB-1)BRI	TAZEWELL	58	5
#MODEL#		CHECKED -	REVISED -					CONTRACT NO. 68894				
		DATE -	REVISED -					(ILLINOIS) FED. AID PROJECT				
				SCALE:		SHEET	OF	SHEETS	STA.	TO	STA.	

<u>EXIST. RAMP "A" C1</u>	<u>EXIST. RAMP "A" C2</u>	<u>EXIST. RAMP "B" C1</u>	<u>EXIST. RAMP "C" C2</u>	<u>EXIST. RAMP "C" C2</u>
PI STA. = 13+23.64	PI STA. = 19+51.80	PI STA. = 8+12.92	PI STA. = 10+13.04	PI STA. = 16+27.50
Δ = 47° 05' 34.30" (RT)	Δ = 76° 37' 53.60" (LT)	Δ = 30° 27' 56.58" (RT)	Δ = 36° 45' 04.40" (RT)	Δ = 41° 24' 53.30" (LT)
D = 07° 30' 00"	D = 33° 59' 57.82"	D = 7° 30' 00.13"	D = 7° 30' 00.13"	D = 17° 00' 00.73"
R = 763.94'	R = 168.52'	R = 763.94'	R = 763.94'	R = 337.03'
T = 332.91'	T = 133.16'	T = 208.03'	T = 253.77'	T = 127.40'
L = 627.90'	L = 225.39'	L = 406.21'	L = 490.01'	L = 243.61'
E = 69.39'	E = 46.26'	E = 27.82'	E = 41.05'	E = 41.05'
e = _____	e = _____	e = _____	e = _____	e = _____
T.R. = _____	T.R. = _____	T.R. = _____	T.R. = _____	T.R. = _____
S.E. RUN = _____	S.E. RUN = _____	S.E. RUN = _____	S.E. RUN = _____	S.E. RUN = _____
P.C. STA. = 9+90.73	P.C. STA. = 18+18.63	P.C. STA. = 6+04.89	P.C. STA. = 7+60.07	P.C. STA. = 15+00.10
P.T. STA. = 16+18.64	P.T. STA. = 20+44.03	P.T. STA. = 10+11.10	P.T. STA. = 12+50.09	P.T. STA. = 17+43.71

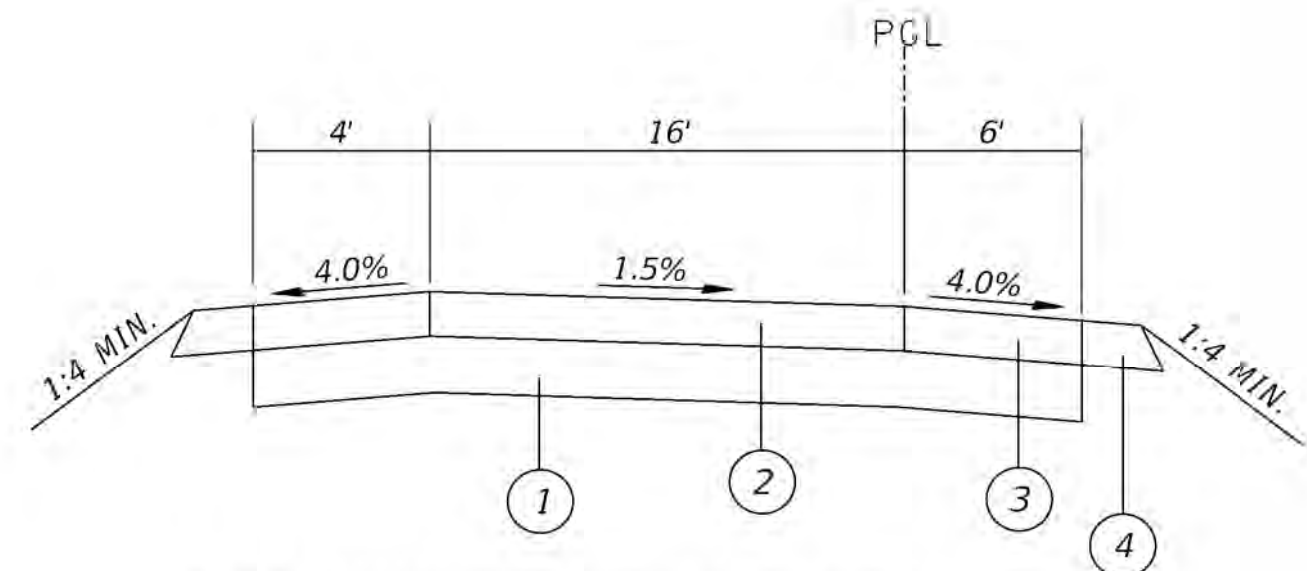


MOVEMENT	YEAR 2018 30TH MAXIMUM HOUR TRAFFIC		PERCENT TRUCK TRAFFIC IN 30TH MAX. HOUR		ESTIMATED PERCENT INCREASE BY 2040	YEAR 2040 30TH MAXIMUM HOUR TRAFFIC	
	A.M.	P.M.	A.M.	P.M.		A.M.	P.M.
AD (L)	32	26	12%	8%	1.3876	44	36
AB (T)	36	19	17%	0%	1.3876	50	26
AC (R)	83	32	6%	0%	1.3876	115	44
BC (L)	478	326	8%	4%	1.3876	663	452
BA (T)	66	33	0%	0%	1.3876	92	46
BD (R)	82	96	21%	7%	1.3876	114	133
CA (L)	55	51	20%	10%	1.3876	76	71
CD (T)	827	1017	4%	5%	1.3876	1148	1411
CB (R)	345	449	2%	2%	1.3876	479	623
DB (L)	112	78	10%	6%	1.3876	155	108
DC (T)	1349	1280	3%	4%	1.3876	1872	1776
DA (R)	33	26	22%	19%	1.3876	46	36
TOTAL A	305	187				423	259
TOTAL B	1119	1001				1553	1389
TOTAL C	3137	3155				4353	4378
TOTAL D	2435	2523				3379	3501

T = THROUGH, L = LEFT, R = RIGHT



PINECREST DRIVE PROPOSED TYPICAL SECTION



I-74 RAMP PROPOSED TYPICAL SECTION

LEGEND:

- ① AGGREGATE SUBGRADE IMPROVEMENT, 12"
- ② PORTLAND CEMENT CONCRETE (JOINTED), 9"
- ③ PORTLAND CEMENT CONCRETE SHOULDERS, 9"
- ④ AGGREGATE SHOULDERS
- ⑤ C.C.C. & G. TYPE B-6.24

FILE NAME =	USER NAME = #USER#	DESIGNED - _____	REVISED - _____	STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION	TYPICAL SECTIONS						F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
#FILE#		DRAWN - _____	REVISED - _____			74	(90-14HB-11B1)	TAZEWELL	58	7					
#MODELNAME#		CHECKED - _____	REVISED - _____			SCALE: _____ SHEET _____ OF _____ SHEETS STA. _____ TO STA. _____					CONTRACT NO. 68894				
		DATE - _____	REVISED - _____								(ILLINOIS FED. AID PROJECT)				

PROJECT AND TRAFFIC INPUTS

(Enter Data in Gray Shaded Cells)

Route: FAI 74 (I-74)	Comments: REPLACEMENT OF STRUCTURE CARRYING PINECREST DRIVE OVER I-74 (SN 090-0091)		
Section: (90-14HB-1)BR1	JOB NO. P-94-010-09		
County: TAZEWELL	Design Date: 04/10/2017	NDF	<-- BY
Location: 2 MI EAST OF IL 8 INTERCHANGE IN E	Modify Date:	<-- BY	
Facility Type: Other Marked State Route		ADT	Year
		Current:	7,200 2016
		Future:	9,143 2040
# of Lanes = 2 or 3		Structural Design Traffic	
Part of future 4 lanes or more ? No		Minimum ADT	Actual ADT
One Way Street ? No			Actual % of Total ADT
Road Class: II			% of ADT in Design Lane
Subgrade Support Rating (SSR): Poor		PV = 0	7,842 94.1%
Construction Year: 2020		SU = 250	376 4.5%
Design Period (DP) = 20 years		MU = 750	116 1.4%
		Struct. Design ADT = 8,333	(2030)
			P = 50%
			S = 50%
			M = 50%

TRAFFIC FACTOR CALCULATION

FLEXIBLE PAVEMENT

Cpv = 0.15
 Csu = **112.06**
 Cmu = **385.44**
 TF flexible (Actual) = 0.88 (Actual ADT)
 TF flexible (Min) = 3.17 (Min ADT Fig. 54-2.C)

RIGID PAVEMENT

Cpv = 0.15
 Csu = **135.78**
 Cmu = **567.21**
 TF rigid (Actual) = 1.18 (Actual ADT)
 TF rigid (Min) = 4.59 (Min ADT Fig. 54-2.C)

NEW CONSTRUCTION / RECONSTRUCTION PAVEMENT DESIGN CALCULATIONS

Full-Depth HMA Pavement		JPC Pavement	
Use TF flexible = 3.17		Use TF rigid = 4.59	
PG Grade Lower Binder Lifts = PG 64-22 (Fig. 53-4.R)		Edge Support = Tied Shoulder or C.&G.	
HMA Mixture Temp. = 76.5 deg. F (Fig. 54-5.C)		Rigid Pavt Thick. = 9.00 in. (Fig. 54-4.E)	
Design HMA Mixture Modulus (E_{HMA}) = 650 ksi (Fig. 54-5.D)			
Design HMA Strain (ϵ_{HMA}) = 86 (Fig. 54-5.E)			
Full Depth HMA Design Thickness = 10.25 in. (Fig. 54-5.F)			
Limiting Strain Criterion Thickness = 15.50 in. (Fig. 54-5.I)			
Use Full-Depth HMA Thickness = 10.25 inches		CRCP Thickness = 7.75 in. (Fig. 54-4.N)	
		TF MUST BE > 60 FOR CRCP	

RECONSTRUCTION ONLY (SUPPLEMENTAL) PAVEMENT DESIGN CALCULATIONS

HMA Overlay of Rubblized PCC		Unbonded Concrete Overlay	
Use TF flexible = 3.17		Review 54-4.03 for limitations and special considerations.	
HMA Overlay Design Thickness = 7.50 in. (Fig. 54-5.U)			
Limiting Strain Criterion Thickness = 11.25 in. (Fig. 54-5.V)			
Use HMA Overlay Thickness = 7.50 inches		JPCP Thickness = NA inches	
		CONTACT BMPR FOR ASSISTANCE	

DESIGN TABLES FROM BDE MANUAL CHAPTER 54 - PAVEMENT DESIGN

Class I Roads	Class II Roads	Class III Roads	Class IV Roads
4 lanes or more Part of a future 4 lanes or more One-way Streets with ADT > 3500	2 lanes with ADT > 2000 One way Street with ADT <= 3500	2 Lanes (ADT 750 - 2000)	2 Lanes (ADT < 750)

Facility Type	PV	SU	MU
Interstate or Freeway	0	500	1500
Other Marked State Route	0	250	750
Unmarked State Route	No Min	No Min	No Min

Class	Rigid (Fig. 54-4.C)		Flexible (Fig. 54-5.B)	
	Csu	Cmu	Csu	Cmu
I	143.81	696.42	132.50	482.53
II	135.78	567.21	112.06	385.44
III	129.58	562.47	109.14	384.35
IV	129.58	562.47	109.14	384.35

ADT	Class
0 - 3500	II
>3501	I

ADT	Class
0 - 749	IV
750 - 2000	III
>2000	II

Number of Lanes	Rural			Urban		
	P	S	M	P	S	M
1 Lane Ramp	100%	100%	100%	100%	100%	100%
2 or 3	50%	50%	50%	50%	50%	50%
4	32%	45%	45%	32%	45%	45%
6 or more	20%	40%	40%	8%	37%	37%

MECHANISTIC DESIGN

DESIGN DATA:

- Class II Road/Minor Arterial/Other Marked State Route
- 2 Lanes – Reconstruction
- Estimated 9,600 SQ YD of new pavement
- Subgrade Support Rating (SSR) = Poor
- Current ADT Year = 2016
- Design Period = 20 years
- Estimated Construction Year = 2020
- Structural Design Year = 2030
- Traffic Growth factor is 1.0% Annually

2016 TRAFFIC	2030 TRAFFIC – Actual Structural Design Traffic
ADT = 7,200	ADT = 8,333
PV = 6,775	PV = 7,842
SU = 324	SU = 376
MU = 101	MU = 116

Number of Facility Lanes	Percent of Total Vehicular Class Volume (ADT) in Design Lane					
	Rural			Urban		
	PV	SU	MU	PV	SU	MU
2 or 3*	50%	50%	50%	50%	50%	50%
4	32%	45%	45%	32%	45%	45%
≥ 6	20%	40%	40%	8%	37%	37%

* One-way roads and streets.

DESIGN LANE DISTRIBUTION FACTORS FOR STRUCTURAL DESIGN TRAFFIC

Figure 54-2.B

Facility Type	PV ①	SU ①	MU ①
Class I Interstates and Freeways	0	500	1500
Class I Other Marked State Routes	0	250	750
Class II, III, and IV Marked State Routes	0	250	750
Class I, II, III, and IV Unmarked State Routes	Use Actual Volumes ②		

MINIMUM VEHICULAR CLASS VOLUMES FOR STRUCTURAL DESIGN TRAFFIC (Mechanistic Design: Rigid and Flexible Pavements)

Figure 54-2.C

COST SUMMARY

FLEXIBLE PAVEMENT

FLEXIBLE PRESENT COST PER LANE-MILE PER YEAR:	\$69,853
TOTAL FLEXIBLE LIFE-CYCLE COST:	\$259,501

RIGID PAVEMENT

RIGID PRESENT COST PER LANE- MILE PER YEAR:	\$53,266
TOTAL RIGID LIFE-CYCLE COST:	\$197,881

PERCENT DIFFERENCE = 31.1%

LIFE-CYCLE COST ANALYSIS: NEW CONSTRUCTION / RECONSTRUCTION**FULL-DEPTH HMA PAVEMENT**

Standard Design

ROUTE
SECTION
COUNTY
LOCATION

FAI 74 (I-74)
(90-14HB-1)BR1
TAZEWELL
2 MI EAST OF IL 8 INTERCHANGE IN E.P.

FACILITY TYPE

INTERSTATE

PROJECT LENGTH 800 FT == > 0.15 Miles
OF CENTERLINES 1 CL
OF LANES 1 LANES
OF EDGES 2 EP
LANE WIDTH - AVERAGE 16 FT
SHOULDER WIDTH HMA Left 4 FT
HMA Right 6 FT
Total Width of Paved Shoulders 10 FT

PAVEMENT THICKNESS (FLEXIBLE) 10.25 IN 15.50 IN MAX
SHOULDER THICKNESS 8.00 IN HMA SD Standard Design
POLICY OVERLAY THICKNESS 3.75 IN

FLEX PAVEMENT	TRAFFIC FACTORS	MINIMUM	ACTUAL	USE
		3.17	0.99	3.17

HMA COST PER TON UNIT PRICE Read Me!

HMA SURFACE	\$104.56 / TON
HMA TOP BINDER	\$126.38 / TON
HMA LOWER BINDER	\$115.19 / TON
HMA BINDER (LEVELING)	\$0.00 / TON
HMA SHOULDER	\$119.74 / TON

INITIAL COSTS

ITEM	THICKNESS	100% QUANTITY	UNIT	UNIT PRICE	COST
HMA PAVEMENT (FULL-DEPTH)	(10.25")	1,422	SQ YD	\$69.90 / SQ YD	\$0
HMA SURFACE COURSE	(2.00")	161	TONS	\$104.56 / TON	\$16,829 ~
HMA TOP BINDER COURSE	(2.25")	185	TONS	\$126.38 / TON	\$23,385 ~
HMA LOWER BINDER COURSE	(6.00")	514	TONS	\$115.19 / TON	\$59,203 ~
HMA SHOULDER	(8.00")	398	TONS	\$119.74 / TON	\$47,683 ~
CURB & GUTTER		0	LIN FT	\$30.00 / LIN FT	\$0
SUBBASE GRAN MATL TY C (TONS)		62	TONS	\$0.00 / TON	\$0
IMPROVED SUBGRADE:	Aggregate Width = 26.7	2,552	SQ YD	\$18.48 / SQ YD	\$47,161
Reserved For User Supplied Item		0	UNITS	\$0.00 / UNITS	\$0
Reserved For User Supplied Item		0	UNITS	\$0.00 / UNITS	\$0
PAVEMENT REMOVAL		1,422	SQ YD	\$0.00 / SQ YD	\$0
SHOULDER REMOVAL		889	SQ YD	\$0.00 / SQ YD	\$0

Note: * Denotes User Supplied Quantity

FLEXIBLE CONSTRUCTION INITIAL COST \$194,261
FLEXIBLE CONSTRUCTION ANNUAL COST PER MILE \$52,292

MAINTENANCE COSTS:

ITEM	THICKNESS	MATERIAL	T	UNIT COST
ROUTINE MAINTENANCE ACTIVITY				\$0.00 / LANE-MILE / YEAR
HMA OVERLAY PVMT SURF	(2.00")	Surface Mix	2.00	\$11.83 / SQ YD
HMA OVERLAY PVMT	(3.75")	Surface Mix	3.75	\$25.21 / SQ YD
HMA SURFACE MIX	(1.50")	Surface Mix	1.50	\$8.85 / SQ YD
HMA BINDER MIX	(2.25")	Top Binder Mix	2.25	\$16.36 / SQ YD
HMA OVERLAY SHLD (Year 30)	(1.75")	Shoulder Mix	1.75	\$11.73 / SQ YD
HMA OVERLAY SHLD	(2.00")	Shoulder Mix	2.00	\$13.41 / SQ YD
MILLING (2.00 IN)			2.00	\$3.00 / SQ YD
PARTIAL DEPTH PVMT PATCH (Mill & Fill Surf)		Surface Mix	2.00	\$81.71 / SQ YD
PARTIAL DEPTH SHLD PATCH (Mill & Fill Surf)		Shoulder Mix	2.00	\$83.41 / SQ YD
PARTIAL DEPTH PVMT PATCH (Mill & Fill +2.00 *)		Leveling Binder Mix	2.00	\$70.00 / SQ YD
PARTIAL DEPTH SHLD PATCH (Mill & Fill +2.00 *)		Shoulder Mix	2.00	\$83.41 / SQ YD
LONGITUDINAL SHOULDER JOINT ROUT & SEAL				\$2.00 / LIN FT
CENTERLINE JOINT ROUT & SEAL				\$2.00 / LIN FT
RANDOM / THERMAL CRACK ROUT & SEAL (100% Rehab = 110.00' / Station / Lane)				\$2.00 / LIN FT

FLEXIBLE TOTAL LIFE-CYCLE COST \$259,501
FLEXIBLE TOTAL ANNUAL COST PER MILE \$69.853

FULL-DEPTH HMA PAVEMENT
HMA OVERLAY OF RUBBLIZED PCC PAVEMENT
Figure 54-7.C
STANDARD DESIGN

MAINTENANCE COSTS:	ITEM	%	QUANTITY	UNIT	UNIT COST	COST	PRESENT WORTH
YEAR 5							
	LONG SHLD JT R&S	100.00%	1,600	LIN FT	\$2.00	\$3,200	
	CNTR LINE JOINT R&S	100.00%	800	LIN FT	\$2.00	\$1,600	
	RNDM / THRM CRACK R&S	50.00%	440	LIN FT	\$2.00	\$880	
	PD PVMT PATCH M&F SURF	0.10%	1	SQ YD	\$81.71	\$82	
	PWFn =	0.8626		PW =	0.8626 X	\$5,762	\$4,970
YEAR 10							
	LONG SHLD JT R&S	100.00%	1,600	LIN FT	\$2.00	\$3,200	
	CNTR LINE JOINT R&S	100.00%	800	LIN FT	\$2.00	\$1,600	
	RNDM / THRM CRACK R&S	50.00%	440	LIN FT	\$2.00	\$880	
	PD PVMT PATCH M&F SURF	0.50%	7	SQ YD	\$81.71	\$572	
	PWFn =	0.7441		PW =	0.7441 X	\$6,252	\$4,652
YEAR 15							
	MILL PVMT & SHLD 2.00"	100.00%	2,311	SQ YD	\$3.00	\$6,933	
	PD PVMT PATCH M&F ADD'L 2.00"	1.00%	14	SQ YD	\$70.00	\$980	
	HMA OVERLAY PVMT 2.00"	100.00%	1,422	SQ YD	\$11.83	\$16,829	
	HMA OVERLAY SHLD 2.00"	100.00%	889	SQ YD	\$13.41	\$11,921	
	PWFn =	0.6419		PW =	0.6419 X	\$36,663	\$23,533
YEAR 20							
	LONG SHLD JT R&S	100.00%	1,600	LIN FT	\$2.00	\$3,200	
	CNTR LINE JOINT R&S	100.00%	800	LIN FT	\$2.00	\$1,600	
	RNDM / THRM CRACK R&S	50.00%	440	LIN FT	\$2.00	\$880	
	PD PVMT PATCH M&F SURF	0.10%	1	SQ YD	\$81.71	\$82	
	PWFn =	0.5537		PW =	0.5537 X	\$5,762	\$3,190
YEAR 25							
	LONG SHLD JT R&S	100.00%	1,600	LIN FT	\$2.00	\$3,200	
	CNTR LINE JOINT R&S	100.00%	800	LIN FT	\$2.00	\$1,600	
	RNDM / THRM CRACK R&S	50.00%	440	LIN FT	\$2.00	\$880	
	PD PVMT PATCH M&F SURF	0.50%	7	SQ YD	\$81.71	\$572	
	PWFn =	0.4776		PW =	0.4776 X	\$6,252	\$2,986
	HMA SD						
YEAR 30	INTERSTATE						
	MILL PVMT ONLY 2.00"	100.00%	1,422	SQ YD	\$3.00	\$4,266	
	PD PVMT PATCH M&F ADD'L 2.00"	2.00%	28	SQ YD	\$70.00	\$1,960	
	PD SHLD PATCH M&F SURF 2.00"	1.00%	9	SQ YD	\$83.41	\$751	
	HMA OVERLAY PVMT 3.75 "	100.00%	1,422	SQ YD	\$25.21	\$35,856	
	HMA OVERLAY SHLD 1.75 "	100.00%	889	SQ YD	\$11.73	\$10,431	
	PWFn =	0.4120		PW =	0.4120 X	\$53,264	\$21,944
YEAR 35							
	LONG SHLD JT R&S	100.00%	1,600	LIN FT	\$2.00	\$3,200	
	CNTR LINE JOINT R&S	100.00%	800	LIN FT	\$2.00	\$1,600	
	RNDM / THRM CRACK R&S	50.00%	440	LIN FT	\$2.00	\$880	
	PD PVMT PATCH M&F SURF	0.10%	1	SQ YD	\$81.71	\$82	
	PWFn =	0.3554		PW =	0.3554 X	\$5,762	\$2,048
YEAR 40							
	LONG SHLD JT R&S	100.00%	1,600	LIN FT	\$2.00	\$3,200	
	CNTR LINE JOINT R&S	100.00%	800	LIN FT	\$2.00	\$1,600	
	RNDM / THRM CRACK R&S	50.00%	440	LIN FT	\$2.00	\$880	
	PD PVMT PATCH M&F SURF	0.50%	7	SQ YD	\$81.71	\$572	
	PWFn =	0.3066		PW =	0.3066 X	\$6,252	\$1,917
							\$65,240
	ROUTINE MAINTENANCE ACTIVITY		0.15	Lane Miles	0.00	\$0	\$0
							MAINTENANCE LIFE-CYCLE COST \$65,240
45	YEAR LIFE CYCLE	CRFn = 0.0407852					MAINTENANCE ANNUAL COST PER MILE \$17,561

PCC PAVEMENT**JPCP**

ROUTE
SECTION
COUNTY
LOCATION

FAI 74 (I-74)
(90-14HB-1)BR1
TAZEWELL
2 MI EAST OF IL 8 INTERCHANGE IN E.P.

FACILITY TYPE

INTERSTATE

PROJECT LENGTH 800 FT ==> 0.15 Miles
OF CENTERLINES 1 CL
OF LANES 1 LANES
OF EDGES 2 EP
LANE WIDTH - AVERAGE 16 FT
SHOULDER WIDTH PCC Left 4 FT
PCC Right 6 FT
Total Width of Paved Shoulders 10 FT

PAVEMENT THICKNESS (RIGID) JPCP 9.00 IN TIED SHLD
SHOULDER THICKNESS 9.00 IN

POLICY OVERLAY THICKNESS 3.75 IN

RIGID PAVEMENT TRAFFIC FACTORS

MINIMUM

ACTUAL

USE

Worksheet Construction Type is Reconstruction The Pavement Type is JPCP

INITIAL COSTS

ITEM	THICKNESS	100% QUANTITY	UNIT	UNIT PRICE	COST
JPC PAVEMENT	(9.00")	1,422	SQ YD	\$50.68 / SQ YD	\$72,067
PAVEMENT REINFORCEMENT		0	SQ YD	\$22.00 / SQ YD	\$0
STABILIZED SUBBASE	(4.00")	1,689	SQ YD	\$0.00 / SQ YD	\$0
PCC SHOULDERS		889	SQ YD	\$42.81 / SQ YD	\$38,058
CURB & GUTTER		0	LIN FT	\$30.00 / LIN FT	\$0
SUBBASE GRAN MATL TY C	(~ 1.80")	118	TONS	\$0.00 / TON	\$0
IMPROVED SUBGRADE:	Aggregate Width = 27.0'	2,400	SQ YD	\$18.87 / SQ YD	\$45,288
Reserved For User Supplied Item		0	UNITS	\$0.00 / UNITS	\$0
Reserved For User Supplied Item		0	UNITS	\$0.00 / UNITS	\$0
PAVEMENT REMOVAL		1,422	SQ YD	\$0.00 / SQ YD	\$0
SHOULDER REMOVAL		889	SQ YD	\$0.00 / SQ YD	\$0

Note: * Denotes User Supplied Quantity

RIGID CONSTRUCTION INITIAL COST \$155,413
RIGID CONSTRUCTION ANNUAL COST PER MILE \$41,834

MAINTENANCE COSTS:

ITEM	THICKNESS	MATERIAL	T	UNIT COST
ROUTINE MAINTENANCE ACTIVITY				\$0.00 / LANE-MILE / YEAR
HMA POLICY OVERLAY	(3.75")		3.75	
HMA POLICY OVERLAY PVMT	(3.75")	1.0195	3.75	\$25.21 / SQ YD
HMA SURFACE MIX	(1.50")	1.0078	1.50	\$8.85 / SQ YD
HMA BINDER MIX	(2.25")	1.0273	2.25	\$16.36 / SQ YD
HMA POLICY OVERLAY SHLD	(3.75")		3.75	\$25.15 / SQ YD
CLASS A PAVEMENT PATCHING				\$195.00 / SQ YD
CLASS B PAVEMENT PATCHING				\$150.00 / SQ YD
CLASS C SHOULDER PATCHING				\$145.00 / SQ YD
PARTIAL DEPTH PVMT PATCH (Mill & Fill HMA Surf)		Surface Mix	1.50	\$78.78 / SQ YD
PARTIAL DEPTH PVMT PATCH (Mill & Fill HMA 1.50")		Surface Mix	1.50	\$78.78 / SQ YD
LONGITUDINAL SHOULDER JOINT ROUT & SEAL				\$2.00 / LIN FT
CENTERLINE JOINT ROUT & SEAL				\$2.00 / LIN FT
REFLECTIVE TRANSVERSE CRACK ROUT & SEAL				\$2.00 / LIN FT
RANDOM CRACK ROUT & SEAL	(100% Rehab = 100.00' / Station / Lane)			\$2.00 / LIN FT

RIGID TOTAL LIFE-CYCLE COST \$197,881
RIGID TOTAL ANNUAL COST PER MILE \$53,266

JOINTED PLAIN CONCRETE PAVEMENT
UNBONDED JOINTED PLAIN CONCRETE OVERLAY
Figure 54-7.A

MAINTENANCE COSTS:	ITEM	%	QUANTITY	UNIT	UNIT COST	COST	PRESENT WORTH
YEAR 10	PAVEMENT PATCH CLASS B	0.10%	1	SQ YD	\$150.00	\$150	
	PWF _n =	0.7441		PW =	0.7441 X	\$150	\$112
YEAR 15	PAVEMENT PATCH CLASS B	0.20%	3	SQ YD	\$150.00	\$450	
	PWF _n =	0.6419		PW =	0.6419 X	\$450	\$289
YEAR 20	PAVEMENT PATCH CLASS B	2.00%	28	SQ YD	\$150.00	\$4,200	
	SHOULDER PATCH CLASS C	0.50%	4	SQ YD	\$145.00	\$580	
	LONGITUDINAL SHLD JT R&S	100.00%	1,600	LIN FT	\$2.00	\$3,200	
	CENTERLINE JT R&S	100.00%	800	LIN FT	\$2.00	\$1,600	
	PWF _n =	0.5537		PW =	0.5537 X	\$9,580	\$5,304
YEAR 25	PAVEMENT PATCH CLASS B	3.00%	43	SQ YD	\$150.00	\$6,450	
	SHOULDER PATCH CLASS C	1.00%	9	SQ YD	\$145.00	\$1,305	
	PWF _n =	0.4776		PW =	0.4776 X	\$7,755	\$3,704
YEAR 30	INTERSTATE						
	PAVEMENT PATCH CLASS B	4.00%	57	SQ YD	\$150.00	\$8,550	
	SHOULDER PATCH CLASS C	1.50%	13	SQ YD	\$145.00	\$1,885	
	HMA POLICY OVERLAY 3.75" (PVMT)	100.00%	1,422	SQ YD	\$25.21	\$35,856	
	HMA POLICY OVERLAY 3.75" (SHLD)	100.00%	889	SQ YD	\$25.15	\$22,351	
	PWF _n =	0.4120		PW =	0.4120 X	\$68,642	\$28,280
YEAR 35	INTERSTATE						
	LONGITUDINAL SHLD JT R&S	100.00%	1,600	LIN FT	\$2.00	\$3,200	
	CENTERLINE JT R&S	100.00%	800	LIN FT	\$2.00	\$1,600	
	RANDOM CRACK R&S	50.00%	400	LIN FT	\$2.00	\$800	
	REFLECTIVE TRANSVERSE CRACK R&S	40.00%	339	LIN FT	\$2.00	\$678	
	PD PVMT PATCH M&F HMA SURF 1.50"	0.10%	1	SQ YD	\$78.78	\$79	
	PWF _n =	0.3554		PW =	0.3554 X	\$6,357	\$2,259
YEAR 40	INTERSTATE						
	PAVEMENT PATCH CLASS B	0.50%	7	SQ YD	\$150.00	\$1,050	
	LONGITUDINAL SHLD JT R&S	100.00%	1,600	LIN FT	\$2.00	\$3,200	
	CENTERLINE JT R&S	100.00%	800	LIN FT	\$2.00	\$1,600	
	REFLECTIVE TRANSVERSE CRACK R&S	60.00%	509	LIN FT	\$2.00	\$1,018	
	RANDOM CRACK R&S	50.00%	400	LIN FT	\$2.00	\$800	
	PD PVMT PATCH M&F HMA SURF 1.50"	0.50%	7	SQ YD	\$78.78	\$551	
	PWF _n =	0.3066		PW =	0.3066 X	\$8,219	\$2,520
							\$42,468
	ROUTINE MAINTENANCE ACTIVITY		0.15	Lane Miles	\$0.00	\$0	\$0
							MAINTENANCE LIFE-CYCLE COST \$42,468
45	YEAR LIFE CYCLE	CRF _n = 0.0407852					MAINTENANCE ANNUAL COST PER MILE \$11,432

LIFE-CYCLE COST ANALYSIS: NEW DESIGN

Calculated / Revised : 11/27/18 10:44 AM

			JPCP	HMA
CONSTRUCTION	INITIAL COST	PRESENT WORTH	\$155,413	\$194,261
		ANNUAL COST PER MILE	\$41,834	\$52,292
MAINTENANCE	LIFE-CYCLE COST	PRESENT WORTH	\$42,468	\$65,240
		ANNUAL COST PER MILE	\$11,432	\$17,561
TOTAL	LIFE-CYCLE COST	PRESENT WORTH	\$197,881	\$259,501
		ANNUAL COST PER MILE	\$53,266	\$69,853

LIFE-CYCLE COST ANALYSIS: FINAL SUMMARY

LOWEST COST OPTION	=====>	JPCP	\$53,266	
OTHER OPTIONS (LOWEST TO HIGHEST):	TYPE / PERCENTAGE	HMA	\$69,853	31.1%

C:\Users\DIAZAA\Desktop\pincrest\I-74 Ramps - IDOT Mechanistic Pavement Design.xlsm]LifeCycleCost

PROJECT AND TRAFFIC INPUTS

(Enter Data in Gray Shaded Cells)

Route: FAI 74 (I-74)	Comments: RECONSTRUCTION OF I-74 RAMP AT PINECREST DRIVE STRUCTURE (SN 090-0091)
Section: (90-14HB-1)BR1	JOB NO. P-94-010-09
County: TAZEWELL	Design Date: 04/18/2017 NDF
Location: 2 MI EAST OF IL 8 INTERCHANGE IN E	Modify Date: 04/18/2017 NDF
Facility Type: Interstate or Freeway	** Ramp Design Fig. 54-1.B **
# of Lanes = 1 Lane Ramp	Crossroad? Other Marked State Route
Road Class: I	# of Lanes = 2 or 3
Subgrade Support Rating (SSR): Poor	Structural Design Traffic
Construction Year: 2020	Minimum ADT
Design Period (DP) = 20 years	Actual ADT
	Actual % of Total ADT
	% of ADT in Design Lane
	PV = 0
	SU = 250
	MU = 750
	Struct. Design ADT = 3,704 (2030)
	Current: 3,200 2018
	Future: 4,064 2040
	P = 100%
	S = 100%
	M = 100%

TRAFFIC FACTOR CALCULATION

FLEXIBLE PAVEMENT

		RAMP DESIGN MIN
Cpv =	0.15	0.15
Csu =	132.5	112.06
Cmu =	482.53	385.44
TF flexible (Actual) =	0.99	(Actual ADT) 3.17
TF flexible (Min) =	3.17	(Min ADT Fig. 54-2.C)

RIGID PAVEMENT

		RAMP DESIGN MIN
Cpv =	0.15	0.15
Csu =	143.81	135.78
Cmu =	696.42	567.21
TF rigid (Actual) =	1.32	(Actual ADT) 4.59
TF rigid (Min) =	4.59	(Min ADT Fig. 54-2.C)

NEW CONSTRUCTION / RECONSTRUCTION PAVEMENT DESIGN CALCULATIONS

Full-Depth HMA Pavement

Use TF flexible =	3.17
PG Grade Lower Binder Lifts =	PG 64-22 (Fig. 53-4.R)
HMA Mixture Temp. =	76.5 deg. F (Fig. 54-5.C)
Design HMA Mixture Modulus (E _{HMA}) =	650 ksi (Fig. 54-5.D)
Design HMA Strain (ε _{HMA}) =	86 (Fig. 54-5.E)
Full Depth HMA Design Thickness =	10.25 in. (Fig. 54-5.F)
Limiting Strain Criterion Thickness =	15.50 in. (Fig. 54-5.I)
Use Full-Depth HMA Thickness =	10.25 inches

JPC Pavement

Use TF rigid =	4.59
Edge Support =	Tied Shoulder or C.&G.
Rigid Pavt Thick. =	9.00 in. (Fig. 54-4.E)

CRC Pavement

Use TF rigid =	4.59
IBR value =	3
CRCP Thickness =	8.00 in. (Fig. 54-4.M)

TF MUST BE > 60 FOR CRCP

RECONSTRUCTION ONLY (SUPPLEMENTAL) PAVEMENT DESIGN CALCULATIONS

HMA Overlay of Rubblized PCC

Use TF flexible =	3.17
HMA Overlay Design Thickness =	7.50 in. (Fig. 54-5.U)
Limiting Strain Criterion Thickness =	11.25 in. (Fig. 54-5.V)
Use HMA Overlay Thickness =	7.50 inches

Unbonded Concrete Overlay

Review 54-4.03 for limitations and special considerations.

JPCP Thickness = NA inches

CONTACT BMPR FOR ASSISTANCE

DESIGN TABLES FROM BDE MANUAL CHAPTER 54 - PAVEMENT DESIGN

Class I Roads	Class II Roads	Class III Roads	Class IV Roads
4 lanes or more	2 lanes with ADT > 2000	2 Lanes	2 Lanes
Part of a future 4 lanes or more	One way Street with ADT <= 3500	(ADT 750 - 2000)	(ADT < 750)
One-way Streets with ADT > 3500			

	Min. Str. Design Traffic (Fig 54-2.C)		
Facility Type	PV	SU*	MU*
Interstate or Freeway	0	500	1500
Other Marked State Route	0	250	750
Unmarked State Route	0	250	750

* Use marked route minimums for unmarked routes (Fig. 54-1.B)

	Traffic Factor ESAL Coefficients			
	Rigid (Fig. 54-4.C)		Flexible (Fig. 54-5.B)	
Class	Csu	Cmu	Csu	Cmu
I	143.81	696.42	132.50	482.53
II	135.78	567.21	112.06	385.44
III	129.58	562.47	109.14	384.35
IV	129.58	562.47	109.14	384.35

Class Table for One-Way Streets	
ADT	Class
0 - 3500	II
>3501	I

Class Table for 2 or 3 lanes (not future 4 lane & not one-way street)	
ADT	Class
0 - 749	IV
750 - 2000	III
>2000	II

	Design Lane Distribution Factors For Structural Design Traffic (Fig. 54-2.B)					
	Rural			Urban		
Number of Lanes	P	S	M	P	S	M
1 Lane Ramp	100%	100%	100%	100%	100%	100%
2 or 3	50%	50%	50%	50%	50%	50%
4	32%	45%	45%	32%	45%	45%
6 or more	20%	40%	40%	8%	37%	37%

MECHANISTIC DESIGN

DESIGN DATA:

- Class I Road / 1 Lane Ramp(s)
- 1 Lane – Reconstruction
- Estimated 1,425 SQ YD of new pavement
- Subgrade Support Rating (SSR) = Poor
- Current ADT Year = 2016
- Design Period = 20 years
- Estimated Construction Year = 2020
- Structural Design Year = 2030
- Traffic Growth factor is 1.0% Annually

2016 TRAFFIC	2030 TRAFFIC – Actual Structural Design Traffic
ADT = 3,200	ADT = 3,704
PV = 3,040	PV = 3,519
SU = 99	SU = 115
MU = 61	MU = 70

Pavement Design:

8. Traffic Factor

Rigid Pavement Traffic Factor - From Equation 54-4.2

$$TF_R (\text{Actual}) = 1.32$$

$$TF_R (\text{Minimum}) = 4.59$$

Flexible Pavement Traffic Factor - From Equation 54-5.2

$$TF_F (\text{Actual}) = 0.99$$

$$TF_F (\text{Minimum}) = 3.17$$

COST SUMMARY

FLEXIBLE PAVEMENT

FLEXIBLE PRESENT COST PER LANE-MILE PER YEAR: \$110,656

TOTAL FLEXIBLE LIFE-CYCLE COST: **\$668,011**

RIGID PAVEMENT

RIGID PRESENT COST PER LANE- MILE PER YEAR: \$83,293

TOTAL RIGID LIFE-CYCLE COST: **\$502,821**

PERCENT DIFFERENCE = 32.9%

LIFE-CYCLE COST ANALYSIS: NEW CONSTRUCTION / RECONSTRUCTION**FULL-DEPTH HMA PAVEMENT**

Standard Design

ROUTE
SECTION
COUNTY
LOCATION

FAI 74 (I-74)
(90-14HB-1)BR1
TAZEWELL
2 MI EAST OF IL 8 INTERCHANGE IN E.P.

FACILITY TYPE NON-INTERSTATE

PROJECT LENGTH 1300 FT ==> 0.25 Miles
OF CENTERLINES 1 CL
OF LANES 2 LANES
OF EDGES 2 EP
LANE WIDTH - AVERAGE 14 FT
SHOULDER WIDTH HMA Left 8 FT
HMA Right 8 FT
Total Width of Paved Shoulders 16 FT

PAVEMENT THICKNESS (FLEXIBLE) 10.25 IN 15.50 IN MAX
SHOULDER THICKNESS 8.00 IN HMA SD Standard Design
POLICY OVERLAY THICKNESS 2.25 IN

FLEX PAVEMENT	TRAFFIC FACTORS	MINIMUM	ACTUAL	USE
		3.17	0.88	3.17

HMA COST PER TON Read Me!

	UNIT PRICE
HMA SURFACE	\$104.56 / TON
HMA TOP BINDER	\$126.38 / TON
HMA LOWER BINDER	\$115.19 / TON
HMA BINDER (LEVELING)	\$0.00 / TON
HMA SHOULDER	\$119.74 / TON

INITIAL COSTS

ITEM	THICKNESS	100% QUANTITY	UNIT	UNIT PRICE	COST
HMA PAVEMENT (FULL-DEPTH)	(10.25")	4,044	SQ YD	\$68.37 / SQ YD	\$0
HMA SURFACE COURSE	(2.00")	456	TONS	\$104.56 / TON	\$47,645 -
HMA TOP BINDER COURSE	(2.25")	519	TONS	\$126.38 / TON	\$65,601 -
HMA LOWER BINDER COURSE	(6.00")	1,418	TONS	\$115.19 / TON	\$163,291 -
HMA SHOULDER	(8.00")	1,035	TONS	\$119.74 / TON	\$123,976 -
CURB & GUTTER		0	LIN FT	\$30.00 / LIN FT	\$0
SUBBASE GRAN MATL TY C (TONS)		96	TONS	\$0.00 / TON	\$0
IMPROVED SUBGRADE:	Aggregate Width = 46.7'	6,747	SQ YD	\$18.48 / SQ YD	\$124,685
Reserved For User Supplied Item		0	UNITS	\$0.00 / UNITS	\$0
Reserved For User Supplied Item		0	UNITS	\$0.00 / UNITS	\$0
PAVEMENT REMOVAL		4,044	SQ YD	\$0.00 / SQ YD	\$0
SHOULDER REMOVAL		2,311	SQ YD	\$0.00 / SQ YD	\$0

Note: * Denotes User Supplied Quantity

FLEXIBLE CONSTRUCTION INITIAL COST \$525,198
FLEXIBLE CONSTRUCTION ANNUAL COST PER MILE \$86,999

MAINTENANCE COSTS:

ITEM	THICKNESS	MATERIAL	UNIT	UNIT COST
ROUTINE MAINTENANCE ACTIVITY				\$0.00 LANE-MILE / YEAR
HMA OVERLAY PVMT SURF	(2.00")	Surface Mix	2.00	\$11.78 / SQ YD
HMA OVERLAY PVMT	(2.25")	Surface Mix	2.25	\$8.82 / SQ YD
HMA SURFACE MIX	(1.50")	Surface Mix	1.50	\$8.82 / SQ YD
HMA BINDER MIX	(0.75")	Binding Binder Mix	0.75	\$0.00 / SQ YD
HMA OVERLAY SHLD (Year 30)	(2.25")	Shoulder Mix	2.25	\$15.09 / SQ YD
HMA OVERLAY SHLD	(2.00")	Shoulder Mix	2.00	\$13.41 / SQ YD
MILLING (2.00 IN)			2.00	\$3.00 / SQ YD
PARTIAL DEPTH PVMT PATCH (Mill & Fill Surf)		Surface Mix	2.00	\$81.71 / SQ YD
PARTIAL DEPTH SHLD PATCH (Mill & Fill Surf)		Shoulder Mix	2.00	\$83.41 / SQ YD
PARTIAL DEPTH PVMT PATCH (Mill & Fill +2.00")		Leveling Binder Mix	2.00	\$70.00 / SQ YD
PARTIAL DEPTH SHLD PATCH (Mill & Fill +2.00")		Shoulder Mix	2.00	\$83.41 / SQ YD
LONGITUDINAL SHOULDER JOINT ROUT & SEAL				\$2.00 / LIN FT
CENTERLINE JOINT ROUT & SEAL				\$2.00 / LIN FT
RANDOM / THERMAL CRACK ROUT & SEAL (100% Rehab = 110.00' / Station / Lane)				\$2.00 / LIN FT

FLEXIBLE TOTAL LIFE-CYCLE COST \$668,011
FLEXIBLE TOTAL ANNUAL COST PER MILE \$110,656

FULL-DEPTH HMA PAVEMENT
HMA OVERLAY OF RUBBLIZED PCC PAVEMENT
Figure 54-7.C
STANDARD DESIGN

MAINTENANCE COSTS:	ITEM	%	QUANTITY	UNIT	UNIT COST	COST	PRESENT WORTH
YEAR 5							
	LONG SHLD JT R&S	100.00%	2,600	LIN FT	\$2.00	\$5,200	
	CNTR LINE JOINT R&S	100.00%	1,300	LIN FT	\$2.00	\$2,600	
	RNDM / THRM CRACK R&S	50.00%	1,430	LIN FT	\$2.00	\$2,860	
	PD PVMT PATCH M&F SURF	0.10%	4	SQ YD	\$81.71	\$327	
	PWFn =	0.8626		PW =	0.8626 X	\$10,987	\$9,477
YEAR 10							
	LONG SHLD JT R&S	100.00%	2,600	LIN FT	\$2.00	\$5,200	
	CNTR LINE JOINT R&S	100.00%	1,300	LIN FT	\$2.00	\$2,600	
	RNDM / THRM CRACK R&S	50.00%	1,430	LIN FT	\$2.00	\$2,860	
	PD PVMT PATCH M&F SURF	0.50%	20	SQ YD	\$81.71	\$1,634	
	PWFn =	0.7441		PW =	0.7441 X	\$12,294	\$9,148
YEAR 15							
	MILL PVMT & SHLD 2.00"	100.00%	6,356	SQ YD	\$3.00	\$19,068	
	PD PVMT PATCH M&F ADD'L 2.00"	1.00%	40	SQ YD	\$70.00	\$2,800	
	HMA OVERLAY PVMT 2.00"	100.00%	4,044	SQ YD	\$11.78	\$47,645	
	HMA OVERLAY SHLD 2.00 "	100.00%	2,311	SQ YD	\$13.41	\$30,994	
	PWFn =	0.6419		PW =	0.6419 X	\$100,507	\$64,512
YEAR 20							
	LONG SHLD JT R&S	100.00%	2,600	LIN FT	\$2.00	\$5,200	
	CNTR LINE JOINT R&S	100.00%	1,300	LIN FT	\$2.00	\$2,600	
	RNDM / THRM CRACK R&S	50.00%	1,430	LIN FT	\$2.00	\$2,860	
	PD PVMT PATCH M&F SURF	0.10%	4	SQ YD	\$81.71	\$327	
	PWFn =	0.5537		PW =	0.5537 X	\$10,987	\$6,083
YEAR 25							
	LONG SHLD JT R&S	100.00%	2,600	LIN FT	\$2.00	\$5,200	
	CNTR LINE JOINT R&S	100.00%	1,300	LIN FT	\$2.00	\$2,600	
	RNDM / THRM CRACK R&S	50.00%	1,430	LIN FT	\$2.00	\$2,860	
	PD PVMT PATCH M&F SURF	0.50%	20	SQ YD	\$81.71	\$1,634	
	PWFn =	0.4776		PW =	0.4776 X	\$12,294	\$5,872
	HMA SD						
YEAR 30	NON-INTERSTATE						
	MILL PVMT & SHLD 2.00"	100.00%	6,356	SQ YD	\$3.00	\$19,068	
	PD PVMT PATCH M&F ADD'L 2.00"	2.00%	81	SQ YD	\$70.00	\$5,670	
	PD SHLD PATCH M&F ADD'L 2.00"	1.00%	23	SQ YD	\$83.41	\$1,918	
	HMA OVERLAY PVMT 2.25 "	100.00%	4,044	SQ YD	\$8.82	\$35,681	
	HMA OVERLAY SHLD 2.25 "	100.00%	2,311	SQ YD	\$15.09	\$34,868	
	PWFn =	0.4120		PW =	0.4120 X	\$97,205	\$40,047
YEAR 35							
	LONG SHLD JT R&S	100.00%	2,600	LIN FT	\$2.00	\$5,200	
	CNTR LINE JOINT R&S	100.00%	1,300	LIN FT	\$2.00	\$2,600	
	RNDM / THRM CRACK R&S	50.00%	1,430	LIN FT	\$2.00	\$2,860	
	PD PVMT PATCH M&F SURF	0.10%	4	SQ YD	\$81.71	\$327	
	PWFn =	0.3554		PW =	0.3554 X	\$10,987	\$3,905
YEAR 40							
	LONG SHLD JT R&S	100.00%	2,600	LIN FT	\$2.00	\$5,200	
	CNTR LINE JOINT R&S	100.00%	1,300	LIN FT	\$2.00	\$2,600	
	RNDM / THRM CRACK R&S	50.00%	1,430	LIN FT	\$2.00	\$2,860	
	PD PVMT PATCH M&F SURF	0.50%	20	SQ YD	\$81.71	\$1,634	
	PWFn =	0.3066		PW =	0.3066 X	\$12,294	\$3,769
							\$142,813
	ROUTINE MAINTENANCE ACTIVITY		0.49	Lane Miles	0.00	\$0	\$0
45	YEAR LIFE CYCLE	CRFn = 0.0407852				MAINTENANCE LIFE-CYCLE COST	\$142,813
						MAINTENANCE ANNUAL COST PER MILE	\$23,657

PCC PAVEMENT**JPCP**

ROUTE
SECTION
COUNTY
LOCATION

FAI 74 (I-74)
(90-14HB-1)BR1
TAZEWELL
2 MI EAST OF IL 8 INTERCHANGE IN E.P.

FACILITY TYPE NON-INTERSTATE

PROJECT LENGTH 1300 FT ==> 0.25 Miles
OF CENTERLINES 1 CL
OF LANES 2 LANES
OF EDGES 2 EP
LANE WIDTH - AVERAGE 14 FT
SHOULDER WIDTH PCC Left 8 FT
PCC Right 8 FT
Total Width of Paved Shoulders 16 FT

PAVEMENT THICKNESS (RIGID) JPCP 9.00 IN TIED SHLD
SHOULDER THICKNESS 9.00 IN

POLICY OVERLAY THICKNESS 2.50 IN

RIGID PAVEMENT	TRAFFIC FACTORS	MINIMUM	ACTUAL	USE
		4.59	1.18	4.59
Worksheet Construction Type is	Reconstruction	The Pavement Type is		JPCP

INITIAL COSTS

ITEM	THICKNESS	100% QUANTITY	UNIT	UNIT PRICE	COST
JPC PAVEMENT	(9.00")	4,044	SQ YD	\$50.68 / SQ YD	\$204,950
PAVEMENT REINFORCEMENT		0	SQ YD	\$22.00 / SQ YD	\$0
STABILIZED SUBBASE	(4.00")	4,478	SQ YD	\$0.00 / SQ YD	\$0
PCC SHOULDERS		2,311	SQ YD	\$42.81 / SQ YD	\$98,934
CURB & GUTTER		0	LIN FT	\$30.00 / LIN FT	\$0
SUBBASE GRAN MATL TY C	(~ 1.80")	282	TONS	\$0.00 / TON	\$0
IMPROVED SUBGRADE:	Aggregate Width = 45.0'	6,500	SQ YD	\$18.87 / SQ YD	\$122,655
Reserved For User Supplied Item		0	UNITS	\$0.00 / UNITS	\$0
Reserved For User Supplied Item		0	UNITS	\$0.00 / UNITS	\$0
PAVEMENT REMOVAL		4,044	SQ YD	\$0.00 / SQ YD	\$0
SHOULDER REMOVAL		2,311	SQ YD	\$0.00 / SQ YD	\$0

Note: * Denotes User Supplied Quantity

RIGID CONSTRUCTION INITIAL COST	\$426,539
RIGID CONSTRUCTION ANNUAL COST PER MILE	\$70,656

MAINTENANCE COSTS:

ITEM	THICKNESS	MATERIAL	UNIT	UNIT COST
ROUTINE MAINTENANCE ACTIVITY				\$0.00 / LANE-MILE / YEAR
HMA POLICY OVERLAY	(2.50")		2.50	
HMA POLICY OVERLAY PVMT	(2.50")	1.0074	2.50	\$8.82 / SQ YD
HMA SURFACE MIX	(1.50")	1.0045	1.50	\$8.82 / SQ YD
HMA BINDER MIX	(1.00")	1.0119	1.00	\$0.00 / SQ YD
HMA POLICY OVERLAY SHLD	(2.50")		2.50	\$16.76 / SQ YD
CLASS A PAVEMENT PATCHING				\$195.00 / SQ YD
CLASS B PAVEMENT PATCHING				\$150.00 / SQ YD
CLASS C SHOULDER PATCHING				\$145.00 / SQ YD
PARTIAL DEPTH PVMT PATCH (Mill & Fill HMA Surf)		Surface Mix	1.50	\$78.78 / SQ YD
PARTIAL DEPTH PVMT PATCH (Mill & Fill HMA 2.50")		Surface Mix	2.50	\$84.64 / SQ YD
LONGITUDINAL SHOULDER JOINT ROUT & SEAL				\$2.00 / LIN FT
CENTERLINE JOINT ROUT & SEAL				\$2.00 / LIN FT
REFLECTIVE TRANSVERSE CRACK ROUT & SEAL				\$2.00 / LIN FT
RANDOM CRACK ROUT & SEAL (100% Rehab = 100.00' / Station / Lane)				\$2.00 / LIN FT

RIGID TOTAL LIFE-CYCLE COST	\$502,821
RIGID TOTAL ANNUAL COST PER MILE	\$83,293

JOINTED PLAIN CONCRETE PAVEMENT
UNBONDED JOINTED PLAIN CONCRETE OVERLAY
Figure 54-7.A

MAINTENANCE COSTS:	ITEM	%	QUANTITY	UNIT	UNIT COST	COST	PRESENT WORTH
YEAR 10	PAVEMENT PATCH CLASS B	0.10%	4	SQ YD	\$150.00	\$600	
	PWFn =	0.7441		PW =	0.7441 X	\$600	\$446
YEAR 15	PAVEMENT PATCH CLASS B	0.20%	8	SQ YD	\$150.00	\$1,200	
	PWFn =	0.6419		PW =	0.6419 X	\$1,200	\$770
YEAR 20	PAVEMENT PATCH CLASS B	2.00%	81	SQ YD	\$150.00	\$12,150	
	SHOULDER PATCH CLASS C	0.50%	12	SQ YD	\$145.00	\$1,740	
	LONGITUDINAL SHLD JT R&S	100.00%	2,600	LIN FT	\$2.00	\$5,200	
	CENTERLINE JT R&S	100.00%	1,300	LIN FT	\$2.00	\$2,600	
	PWFn =	0.5537		PW =	0.5537 X	\$21,690	\$12,009
YEAR 25	PAVEMENT PATCH CLASS B	3.00%	121	SQ YD	\$150.00	\$18,150	
	SHOULDER PATCH CLASS C	1.00%	23	SQ YD	\$145.00	\$3,335	
	PWFn =	0.4776		PW =	0.4776 X	\$21,485	\$10,261
YEAR 30	NON-INTERSTATE						
	PAVEMENT PATCH CLASS B	4.00%	162	SQ YD	\$150.00	\$24,300	
	SHOULDER PATCH CLASS C	1.50%	35	SQ YD	\$145.00	\$5,075	
	HMA POLICY OVERLAY 2.5" (PVMT)	100.00%	4,044	SQ YD	\$8.82	\$35,681	
	HMA POLICY OVERLAY 2.5" (SHLD)	100.00%	2,311	SQ YD	\$16.76	\$38,743	
	PWFn =	0.4120		PW =	0.4120 X	\$103,799	\$42,764
YEAR 35	NON-INTERSTATE						
	LONGITUDINAL SHLD JT R&S	100.00%	2,600	LIN FT	\$2.00	\$5,200	
	CENTERLINE JT R&S	100.00%	1,300	LIN FT	\$2.00	\$2,600	
	RANDOM CRACK R&S	50.00%	1,300	LIN FT	\$2.00	\$2,600	
	REFLECTIVE TRANSVERSE CRACK R&S	40.00%	974	LIN FT	\$2.00	\$1,948	
	PD PVMT PATCH M&F HMA 2.50"	0.10%	4	SQ YD	\$84.64	\$339	
	PWFn =	0.3554		PW =	0.3554 X	\$12,687	\$4,509
YEAR 40	NON-INTERSTATE						
	PAVEMENT PATCH CLASS B	0.50%	20	SQ YD	\$150.00	\$3,000	
	LONGITUDINAL SHLD JT R&S	100.00%	2,600	LIN FT	\$2.00	\$5,200	
	CENTERLINE JT R&S	100.00%	1,300	LIN FT	\$2.00	\$2,600	
	REFLECTIVE TRANSVERSE CRACK R&S	60.00%	1,462	LIN FT	\$2.00	\$2,924	
	RANDOM CRACK R&S	50.00%	1,300	LIN FT	\$2.00	\$2,600	
	PD PVMT PATCH M&F HMA 2.50"	0.50%	20	SQ YD	\$84.64	\$1,693	
	PWFn =	0.3066		PW =	0.3066 X	\$18,017	\$5,523
							\$76,282
	ROUTINE MAINTENANCE ACTIVITY		0.49	Lane Miles	\$0.00	\$0	\$0
							MAINTENANCE LIFE-CYCLE COST \$76,282
45	YEAR LIFE CYCLE	CRFn = 0.0407852					MAINTENANCE ANNUAL COST PER MILE \$12,636

LIFE-CYCLE COST ANALYSIS: NEW DESIGN

Calculated / Revised : 11/27/18 10:44 AM

CONSTRUCTION	INITIAL COST		JPCP	HMA
			PRESENT WORTH	PRESENT WORTH
		ANNUAL COST PER MILE	\$426,539	\$525,198
MAINTENANCE	LIFE-CYCLE COST		\$70,656	\$86,999
		PRESENT WORTH	\$76,282	\$142,813
		ANNUAL COST PER MILE	\$12,636	\$23,657
TOTAL	LIFE-CYCLE COST			
		PRESENT WORTH	\$502,821	\$668,011
		ANNUAL COST PER MILE	\$83,293	\$110,656

LIFE-CYCLE COST ANALYSIS: FINAL SUMMARY

LOWEST COST OPTION	=====>	JPCP	\$83,293	
OTHER OPTIONS (LOWEST TO HIGHEST):	TYPE / PERCENTAGE	HMA	\$110,656	32.9%

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